The Ultrasonic Polar Scan - a Sophisticated Nondestructive Method for Characterizing (Damaged) Anisotropic Media

In the early 1980's, the ultrasonic polar scan (UPS) technique was developed to assess the fiber direction of composites in a nondestructive way. In spite of the recognition by several researchers as being a sophisticated and promising methodology for nondestructive testing and materials science, little advance was made during the following 30 years. Recently however, the UPS technique experienced a strong revival and various modifications to the original UPS setup have been successfully implemented. This revival has exposed several powerful capabilities and interesting applications of the UPS technique for (composite) materials science:

- Determination of orthotropic viscoelastic tensor
- Identification of 3D strain tensor
- Assessment of fatigue damage
- Determination of porosity volume
- Evaluation of fiber distortion
- Detection of delaminations

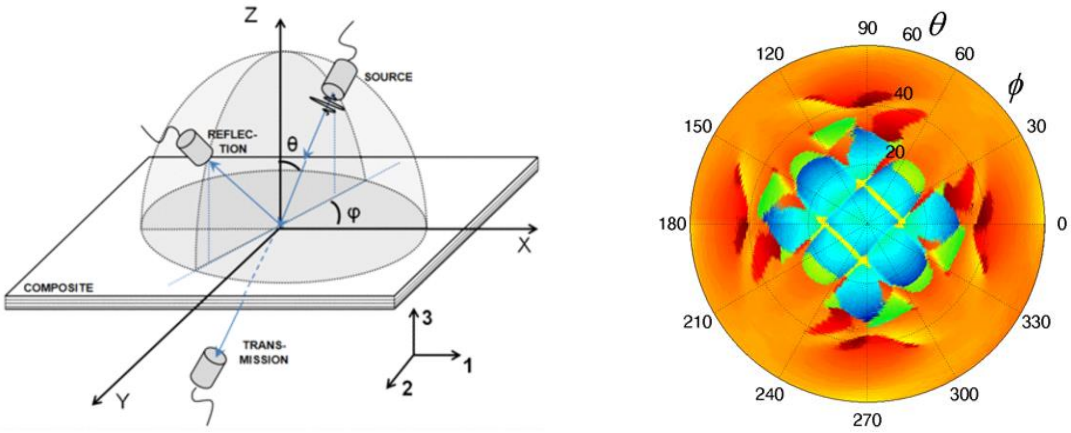

Figure 1: (Left) UPS schematic and (right) UPS image for $[+45;-45]_{2S}$ C/E

This talk will give a short historical overview of the results obtained with the UPS technique for inspecting and characterizing (damaged) composites. At present, we are investigating several novel research lines in order to bring the UPS technique to the next level of maturity, and to expand its applicability to a broader range of materials. Several opportunities for future investigations are given.

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